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## TESTS FOR INDICATING AMOUNT OF BLANCHING

Investigators who have studied the relation between quality of dehydrated vegetables and amount of blanching have generally tried to correlate the blanching treatment with one or more of the changes that occur during blanching. (Unfortunately, considerable work along this line remains to be done.) Because of the ease and rapidity with which enzyme tests can be carried out, enzyme destruction during blanching has been followed almost exclusively. It should be noted that this is a more or less empirical procedure and does not constitute proof that enzyme destruction is the only purpose for blanching.

There are indications that the amount of destruction for a given blanching treatment may vary not only with the vegetable but also with the variety, maturity, raw storage condition, and other factors. It is obvious, of course, that the particle size of the prepared vegetable, the load in the blancher, and the operating efficiency of the blanching equipment will cause variations independent of the variations in the raw vegetable. Although the effect of these variables on the enzyme tests in relation to adequacy of blanching cannot at present be accurately defined, the knowledge that they have some effect emphasizes the importance of control tests during processing.

The following tests, used both in the frozen pack and the dehydrated vegetable industries, should be used routinely by the processor to indicate the degree of blanching he is obtaining. With certain exceptions, Government specifications for dehydrated vegetables require that the peroxidase or catalase test be negative. The methods described below are used in determining whether or not the products meet this requirement. It is a good practice to run tests periodically on the wet blanched product as well as on the dried product as it comes from the drying tray. Comments concerning the tests on specific vegetables are given on page 3.

### METHOD

Two methods have been used for obtaining the finally desired concentration of reagents for carrying out the peroxidase and catalase tests. Method I has been used in the past while Method II gives the same results as the older method, but it utilizes 30 percent hydrogen peroxide instead of the less stable 3 percent hydrogen peroxide.

The Vegetables are prepared as follows: Samples consisting of about 20 gms. of wet or 5 gms. of dry product are placed in beakers and covered with 50 cc and 70 cc of water respectively. Dried samples should be refreshed before testing by allowing them to stand at room temperature for about one hour.

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The reagents required are:

Method I: 3 percent hydrogen peroxide made up fresh shortly before use by dilution of 30 percent hydrogen peroxide with distilled water, 1 percent guaiacol in 95 percent undenatured ethyl alcohol, 1 percent benzidine in 95 percent undenatured alcohol. In this method the reagents are added separately.

Method II: 30 percent hydrogen peroxide (Merck's "superoxol" and most preparations of 30 percent hydrogen peroxide are satisfactory). Guaiacol and benzidine solutions as described for Method I. In this method two drops of 30 percent hydrogen peroxide are added to 10 c.c. of the guaiacol or benzidine solutions. One c.c. of this combined reagent is then added to the prepared samples. The combined reagent should not be used if it has stood more than one hour in the case of guaiacol or 15 minutes in the case of benzidine. (The advantages of this method are that it avoids the use of dilute peroxide which is unstable, and it decreases the chances that one of the reagents is inadvertently omitted in the test. Even the 30 percent peroxide should be kept in a cool place. In order to avoid contamination of the peroxide a small amount of it should be poured into a beaker so that it is not necessary to insert the dropper into the bottle.)

PEROXIDASE

Procedure:

Method I. Add 1 c.c. of 1 percent guaiacol (or of benzidine) and then two drops of 3 percent hydrogen peroxide to prepared samples.

Method II. Add 1 c.c. of combined reagent (guaiacol, or benzidine, and hydrogen peroxide) to prepared samples.

The test is read after 30 minutes standing at 70 to 80° F (greater temperature variations than this may give a false positive or a false negative test). Any trace of pink or reddish coloration of the solution or solid particles when guaiacol is used, or blue or black coloration when benzidine is used is read as a positive reaction. Coloration of skins or defects are not read as positive. The concentration of the reagents in the sample should be; hydrogen peroxide 0.05 to 0.01 percent, guaiacol or benzidine 0.017 to 0.023 percent (greater variations than these may give false positive or false negative results).

A test on a sample boiled for five minutes should be run when it is suspected that a positive result is due to a heat stable substance.

Test of reagent: When negative tests are obtained it is a good plan to test the reagent on some of the raw vegetable. Whereas a negative test in this case means that one or more of the reagents are faulty, a positive test (because of the high enzyme content of raw vegetables) does not mean that the concentrations of the reagents are necessarily within the right range.

## CATALASE

Procedure:

Method I. One of two c.c. of 3 percent hydrogen peroxide are added to prepared samples.

Method II. Two to four drops of 30 percent hydrogen peroxide are added to the prepared samples.

The continuous evolution of small bubbles of oxygen constitutes a positive reaction. It is easy to distinguish these small bubbles from the larger bubbles of air that are evolved occasionally. The use of larger amounts of water and correspondingly larger amounts of peroxide per sample will facilitate observation of the bubbles.

Tests on boiled samples may be run when it is suspected that a positive result is due to a heat stable substance. The reagent may be tested qualitatively by use of the raw vegetable.

Carrots, white potatoes, sweet potatoes and parsnips:

Early specifications have required that the peroxidase test be negative for these vegetables. Laboratory tests have shown that the peroxidase tests as described will become negative with fairly reasonable amounts of blanching. The benzidine test is used in testing carrots and sweet potatoes because it gives a contrasting color. The guaiacol test is used for testing potatoes and parsnips. Blanching should continue for about a minute longer than is required to obtain a product giving a negative test.



Rutabagas (yellow turnips) and beets:

Although early specifications have required that the peroxidase test be negative for these vegetables, a negative test cannot be obtained without considerable blanching or cooking. The processor should make sure that dehydrated rutabagas and beets which he proposes to prepare will meet current specifications.

Cabbage and celery:

The catalase test is at present required to be negative.

Spinach, chard, mustard greens, kale, and peas:

It is likely that only the catalase test will be required to be negative.

Sweet corn and green lima beans:

It is likely that the peroxidase test will be required to be negative. Rehydrated corn is triturated and strained through cheesecloth to remove the skins before testing. The skins are removed from the lima beans before testing.